

WHAT IS CLAIMED IS:

1. A colloidal composition comprising:
a silicate doped with a metal; and
a stabilizer dispersed within the silicate.

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2. The colloidal composition of claim 1, wherein the silica doped with metal includes about 35 wt % or less of the metal based on silica.

10 3. The colloidal composition of claim 1, wherein the stabilizer includes a quaternary compound.

4. The colloidal composition of claim 3, wherein the quaternary compound is a quaternary amine.

15 5. The colloidal composition of claim 1, wherein an amount of the stabilizer correlates to an amount of the metal.

20 6. A colloidal silicate composition doped with a metal comprising one or more silicate particles doped with a metal wherein the metal is dispersed within one or more of the silicate particles.

7. The colloidal silicate composition of claim 6, wherein the metal is dispersed in a controlled manner.

25 8. The colloidal silicate composition of claim 6, wherein one or more of the silicate particles includes a layered structure.

9. The colloidal silicate composition of claim 8, wherein the metal is controllably dispersed within one or more particle layers of the layered structure.

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10. The colloidal silicate composition of claim 6, wherein the metal is selected from the group consisting of an alkali metal, an alkaline earth metal, a 1st row transition metal, a 2nd row transition metal, a lanthanide, and combinations thereof.

5 11. The colloidal silicate composition of claim 10, wherein the silica doped with metal includes about 2 wt % or less of the metal based on silica.

12. A method of forming a colloidal composition, the method comprising the steps of:

10 preparing a heel solution including a stabilizer;
preparing a silicic acid solution; and
mixing and further processing the heel solution and the silicic acid solution to form the colloidal composition.

15 13. The method of claim 12, wherein a metal is added to the heel solution.

14. The method of claim 13, wherein the colloidal composition includes the stabilizer and a silicate doped with the metal such that the stabilizer and the metal are dispersed within one or more particles of the silicate.

20 15. The method of claim 14, wherein the silicate doped with metal includes about 35 wt % or less of the metal based on silica.

16. The method of claim 12, wherein the colloidal composition is further processed to form a crystalline structure.

25 17. The method of claim 16, wherein the colloidal composition is further processed by heating.

18. The method of claim 16, wherein a metal is added to the heel prior to crystallization.

19. The method of claim 18, wherein the colloidal composition includes a
5 zeolite.

20. The method of claim 12, wherein the stabilizer includes a quaternary amine.

10 21. A method of forming a colloidal silicate composition, the method comprising the steps of:

preparing a silicic acid solution, a metal silicate solution and an alkaline solution;
mixing and further processing the silicic acid solution and the metal silicate solution with the alkaline solution; and

15 forming one or more silicate particles doped with a metal wherein the metal is dispersed within one or more of the silicate particles.

22. The method of claim 21, wherein the metal is dispersed in a controlled manner.

20 23. The method of claim 21, wherein the silica particles doped with metal include about 2 wt% of the metal based on silica.

24. The method of claim 21, wherein the metal is selected from the group
25 consisting of an alkali metal, an alkaline earth metal, a 1st row transition metal, a 2nd row transition metal, a lanthanide, and combinations thereof.

25. A method of controlling a location of a metal within a metal-containing silica colloid, the method comprising the steps of:

preparing a silicic acid solution, a metal silicate solution and an alkaline solution; and

5 selectively adding the metal silicate solution and the silicic acid solution to the alkaline solution to form a colloid of silica particles containing the metal.

10 26. The method of claim 25, further comprising adding the metal silicate solution before the silicic acid solution and forming the colloid of silica particles wherein the metal is dispersed within an interior layer of one or more of the silica particles.

15 27. The method of claim 25, further comprising adding the silicic acid solution before the metal silicate solution and forming the colloid of silica particles wherein the metal is dispersed within an outer layer of one or more of the silica particles.

28. The method of claim 25, further comprising adding the metal silicate solution and the silicic acid solution in an alternating manner and forming the colloid of silica particles having a metal-containing layer and a non-metal containing layer.

20 29. The method of claim 28, wherein one or more of the silica particles includes a layered structure that has the non-metal containing layer disposed on the metal containing layer in a repeat manner.

25 30. A material for use in an industrial application comprising the colloidal composition of claim 1.

31. The material of claim 30 wherein the industrial application is selected from the group consisting of dental applications, protein separation, molecular sieves, nanoporous membranes, wave guides, photonic crystals, refractory applications, clarification of wine and juice, chemical mechanical planarization of semiconductor and
5 disk drive components, catalyst supports, retention and drainage aids in papermaking, fillers, surface coatings, ceramic materials, investment casting binders, flattening agents, proppants, cosmetic formulations and polishing abrasives.